5621
Habitat

GLEN C. SANDERSON

# SHRUBS FOR WILDLIFE HABITAT IMPROVEMENT IN SOUTHERN MICHIGAN

By Gordon Zorb

Pheasants feeding on fruits of autumn olive
Photo: USDA - Soil Conservation Service

MICHIGAN DEPARTMENT OF CONSERVATION
Research and Development Report No. 81
July, 1966

A contribution in part from Federal Aid in Wildlife
Restoration Project Michigan 40-R

## Cover Photograph

The cover photo was taken by Mr. Dorian Carroll, Manager of the S.C.S. Plant Materials Center at Rose Lake. The planting is a single row of autumn olive that borders the road by the Plant Materials headquarters. Dorian observed pheasants using the planting regularly through the winter. Most interesting, I believe, is that the birds continued to use the planting--scratching through the snow--even after the last berries were removed from the plants.

Rose Lake is indebted to the Plant Materials Center, not only for this photo, but for their excellent cooperation and help in all phases of trials and propagation of new plant materials for use in wildlife plantings.

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# SHRUBS FOR WILDLIFE HABITAT IMPROVEMENT IN SOUTHERN MICHIGAN[1]

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In this report we hope to clarify the position of the Michigan game biologists on the use of shrubs in wildlife habitat plantings. Perhaps we will provide some answers to frequently asked questions--What are the most appropriate shrub species to use? Where and how should they be planted? What are the most effective ways to care for these plantings during the establishment period? How large should the plantings be to give the greatest benefit to wildlife? What are the problems in this area that need the most attention from research biologists?

There are three main sections to the report. The first, a summary of the opinions and ideas of 28 experienced game biologists and game area managers, is the basic reason for the report. A second section reviews the opinions of New York game biologists on some of the same shrubs that we are using in our own program. The final section summarizes some general recommendations concerning plantings and their care which we feel will give the best results. This paper should be considered as a progress report; and I would hope that we can continue to select better species, find better ways to care for the plantings, and report on such findings regularly. An appendix includes a list of scientific names of plants used in the report and a page of hints from Earl Gordinier on the use of herbicides.

## Shrub Appraisals by Michigan Wildlife Managers

This section of the report is a compilation of the opinions and ideas of 28 game biologists and game area managers concerning shrubs used in our program of wildlife habitat improvement. These men are working, or have worked, closely with this program and collectively represent over 400 years of experience.

The information was gathered by means of an opinion poll. Its purpose was to organize our thoughts so that we could (1) eliminate from use those plants

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with little wildlife value (little game use or difficult to establish); (2) establish a list of the most valuable plants; (3) gather ideas on how planting methods, site selection of plantings, and care can increase their growth, their success and their benefits to game; and (4) give researchers an idea of where to concentrate their efforts.

A two-page "Shrub Appraisal" form was sent to the most experienced game biologists and game area managers. The appraisal consisted of four parts: (1) A rating sheet listing 21 different shrubs, each to be graded "excellent," "fair," or "poor" for: use as food by game birds and rabbits; use as cover; quality of survival and growth; and a place for a vote on whether to "use" or "not to use" the shrub. (2) A section for listing, in order, the five best shrubs for wildlife plantings. (3) A section for detailed comments on individual species. (4) Space for listing research needs. Response was excellent and high interest was indicated by the many comments and suggestions.

## Summary of the Species Rating Sheet and the List of Five "Best" Species

The scores of the rating sheet are given in Table 1. Not everyone was familiar with all 21 of the species or with each aspect of individual species so that the totals do not add up to the maximum possible for the 28 men participating. According to the vote totals we should continue to use 10 species and drop 11 species. Following is a list of the 21 species divided into two columns, "Use" and "Do not use." The rank from the "five best" shrub list is based on five points for No. 1 rating, four for No. 2 rating, etc. The total votes received on this basis are listed in parentheses. Shrub ratings by Michigan wildlife managers are as follows:

| "Use" | "Do not use" |
|---|---|
| 1. Autumn olive (117) | Morrow's, tartarian, |
| 2. Multiflora rose (104) | and Amur honeysuckle |
| 3. Siberian crab (45) | Coralberry |
| 4. Gray dogwood (39) | False indigo |
| 5. Buffalo berry (23) | Arrowwood |
| 6. Washington haw (22) | Fragrant sumac |
| 7. Highbush cranberry (21) | Hazelnut |
| 8. Silky dogwood (13) | Sand cherry |
| 9. Wild grape (11) | Forsythia |
| 10. Nannyberry (6) | Bicolor lespedeza |
| | Bayberry |

From the "approved" list of shrubs I would recommend four to be used in full scale management plantings: autumn olive, multiflora rose, Siberian

Table 1. Summary of shrub appraisals by 28 southern Michigan game managers.

| Species | Used as Food By: Game Birds | | | Rabbits | | | Used as Cover | | | Survival & Growth | | | Recommendations | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | E[a] | F | P | E | F | P | E | F | P | E | F | P | Use | Do Not Use |
| Multiflora rose | 7[b] | 18 | 3 | 11 | 10 | 7 | 22 | 6 | 0 | 3 | 22 | 3 | 27 | 1 |
| Morrows or tartarian honeysuckle | 0 | 3 | 21 | 0 | 4 | 20 | 2 | 13 | 11 | 17 | 7 | 2 | 2 | 24 |
| Amur honeysuckle | 0 | 2 | 7 | 0 | 1 | 8 | 0 | 1 | 8 | 5 | 2 | 2 | 0 | 9 |
| Coralberry | 0 | 0 | 18 | 0 | 1 | 17 | 0 | 8 | 10 | 0 | 9 | 9 | 2 | 16 |
| False indigo | 0 | 0 | 14 | 2 | 2 | 10 | 1 | 6 | 9 | 8 | 5 | 3 | 1 | 15 |
| Wild grape | 19 | 2 | 1 | 3 | 3 | 15 | 7 | 8 | 7 | 1 | 4 | 21 | 17 | 5 |
| Silky dogwood | 7 | 6 | 5 | 3 | 9 | 8 | 4 | 10 | 6 | 4 | 18 | 3 | 13 | 7 |
| Gray dogwood | 21 | 2 | 0 | 3 | 8 | 7 | 5 | 12 | 3 | 4 | 13 | 4 | 19 | 2 |
| Siberian crab | 10 | 6 | 1 | 7 | 9 | 1 | 2 | 7 | 8 | 6 | 11 | 0 | 17 | 0 |
| Washington hawthorn | 8 | 9 | 0 | 5 | 5 | 2 | 3 | 7 | 2 | 2 | 7 | 8 | 16 | 1 |
| Autumn olive | 23 | 4 | 0 | 10 | 10 | 2 | 13 | 12 | 2 | 24 | 3 | 0 | 28 | 0 |
| Buffalo-berry | 3 | 5 | 2 | 2 | 5 | 3 | 7 | 5 | 0 | 8 | 2 | 0 | 11 | 2 |
| Highbush cranberry | 6 | 14 | 3 | 2 | 3 | 16 | 6 | 10 | 8 | 9 | 10 | 2 | 19 | 6 |
| Arrowwood | 1 | 3 | 7 | 0 | 5 | 6 | 0 | 4 | 7 | 1 | 6 | 4 | 0 | 11 |
| Nannyberry | 5 | 11 | 3 | 2 | 10 | 7 | 3 | 10 | 4 | 5 | 8 | 6 | 11 | 8 |
| Fragrant sumac | 0 | 6 | 5 | 1 | 8 | 4 | 1 | 5 | 6 | 1 | 5 | 9 | 3 | 12 |
| Hazelnut | 1 | 3 | 6 | 0 | 9 | 7 | 4 | 8 | 5 | 3 | 10 | 4 | 6 | 11 |
| Sand cherry | 0 | 4 | 12 | 2 | 2 | 13 | 7 | 8 | 7 | 7 | 9 | 6 | 5 | 17 |
| Forsythia | 0 | 1 | 10 | 1 | 7 | 3 | 1 | 6 | 6 | 9 | 2 | 2 | 3 | 10 |
| Bicolor lespedeza | 1 | 0 | 15 | 2 | 5 | 9 | 3 | 9 | 4 | 2 | 10 | 1 | 3 | 13 |
| Bayberry | 0 | 1 | 12 | 0 | 2 | 11 | 0 | 3 | 10 | 0 | 8 | 5 | 1 | 12 |

[a] E-excellent, F-fair, P-poor.

[b] Numerals represent the number of individuals grading a species in each category. In many cases not all of the participating appraisers were familiar enough with a species to grade it. Total scores within categories therefore do not always add up to 28.

crab, and highbush cranberry. A fifth, buffalo berry, seems a likely candidate for full use, but I imagine it will be several years before the Southern Michigan Nursery will be able to supply large amounts of planting stock. We should make an effort to see that each district obtains some of the first available stock so that all of us can get a chance to form an opinion on its value. I would place Washington haw in the same category. This needs to be planted in all districts under a variety of conditions before widespread use can be recommended.

The dogwoods, grape, and nannyberry do not fit in well with the large, prepared-site plantings that most of us recommend. For the present I think their use should be confined to a few special sites, to management by cuttings, or to special hand-planting in scalps if manpower is available.

## Comments on Individual Species

Below are some of the comments by biologists concerning game use, site, care, and effectiveness of individual shrub species. There are not enough field plantings of some species--buffalo berry, Washington haw, and Amur honeysuckle--for all of us to have a fair appraisal.

Autumn olive. Rated either first or second by everyone who has had experience with it. "Had 100% survival on sandy, dry sites in Lake County. Deer browsing was heavy." "Does well on variety of soils and tolerates dry sites." "Have seen grouse eat berries; rabbits crossing road 20 rods to browse. Carry fruits on into winter." "Next to buffalo berry this is the best of all we have planted--deer, grouse, and rabbits. Does best in partial shade with soil preparation, fertilizer, and lime but will grow as well as most without soil preparation." "Rapid growth, abundant early fruit." "Hard winter may cause die-back, but resprouts." "Edible by man, beast and bird." "Have one site that is spreading, apparently through bird droppings," (only observation of this). "Excellent plant, fruits may not persist into winter, good cover."

Multiflora rose. Rated below autumn olive for bird food and for growth, but above autumn olive for cover. Everyone realizes that multiflora rose requires good soil and moisture plus care for about two years. If we were restricted to two species--olive for poor sites, rose for good--we would probably do a satisfactory job. "One of our best for good sites." "Excellent when planted under good conditions." "Forget it," (Thumb). "Easily sod-bound early in life." "Only on better sites after summer fallowing." "Don't plant on sands." "Good cover if planted in thick enough clumps or wide rows. Freezes back every year (N.W. Region III)." "Best use in clumps of 6-10 rows in hollows where washed in soil and better moisture occurs." "With first year cultivation generally comes good. Heavy sod is a competitor after a few years and reduces vigor."

Siberian crab. Fair to excellent for bird and rabbit food, poor to fair cover, and fair to excellent survival. "All wildlife uses it and it grows on a variety of soils." "Abundant fruit used by birds; plant closer spacing." "Susceptible to mice damage." "Will grow in partial shade, valuable for deer, rabbits as well as grouse." "One of best." "There seems to be a big difference in use by wildlife." "Rabbit browsing on early stages tends to prune and thicken some plants. Occasionally overbrowsing."

Siberian crab presents some special problems. The fruits of some are not eaten at all, others fall off as soon as they ripen, and still others are very preferred by song birds and are eaten immediately. The most desirable for wildlife plantings are those that remain on until mid-winter and then are eaten. If you could observe the use of your crab plantings, tag the plants with the best characteristics and make seed collections for the nursery only from these plants. This would be a first step. Since the seed doesn't always result in a plant with the parent's characteristics, we may have to go to cuttings from these superior plants. This sounds "too intensive," but if we plant and care for only superior plants we may save time and money in the long run.

Buffalo berry. Our friends from the Thumb snowed me on this one, and I have the feeling they are right. From the few mature plantings at Rose Lake it looks similar to autumn olive as to site requirements and fruit production (perhaps slower growing) and better for cover (it spreads from suckers). Perhaps more hardy than autumn olive and might be a grouse plant in Region II. I know nothing about game use, but Harold Tubbs says, "Ultimate in shrubs. If we had always used it we would need longer seasons and bigger bag limits. Hunters killing deer, grouse and rabbits--fruits are good canned and frozen, etc. etc." If our representatives in the Thumb will spend the next few falls picking fruit for the nursery we can all get in on this bountiful shrub.

Highbush cranberry. Best of viburnums for range of site requirements, survival and persistence of fruits. "Good on moist sites, fruit persistent and used in mid-winter." "Looks good for grouse if we can get it in better grouse sites." "Prefer native to European." "Slow grower, needs good soils." "Will grow in dryer sites than other viburnums." "Easy to grow, fruits well and persistent. We should use the native plants."

Washington haw. Good fruit producer which gained fame from Mason Building observations. Not to be confused with earlier haws we have used. Probably need more field observation. "I consider this as good as autumn olive or gray dogwood. Fruit persists late in winter, will grow almost anywhere." "Slow grower, does better in large clumps. Deer, grouse and rabbits feed on fruit." "Washington haw, the only haw we should plant."

Gray dogwood. No question about it being heavily used by grouse and pheasants. I think most of us were thinking about natural areas rather than

plantings on our appraisals. Nursery (at least S.C.S. Plant Materials Center) has had little success getting seedlings, and Rose Lake has had poor luck in plantings. "Plenty of native stock available with more coming in through natural succession." "We have had no experience with plantings, but feel it should be used where needed for grouse." "...does not show up well unless planted in close clumps and partial shade. Requires more moisture for good growth."

Grape. Excellent for grouse, pheasants--no rabbit browsing. "Frost damage most years (Thumb)." "Probably deserves better trial." "Need better techniques, suggest local cuttings." "Discouraging survival but should be kept on list. Try planting cuttings." "Train on old fences." "Poor survival, better luck encouraging existing wild grape." "A little difficult to grow. Maybe we should use older planting stock."

Nannyberry. Requires better site than highbush cranberry. "Good survival on damp sites." "Several pheasants with full crops of these berries. Survival might be better if we used older planting stock." "Produces fair. Growth slow. Heavy use by grouse." "Good plant but needs moist, rich soil."

Silky dogwood. Majority voted to keep it in use but there were not many individual comments. I think autumn olive or crab would do a better job on the same sites. "Very slow grower but will grow on poorer soils." "Excellent grouse shrub. Some difficulty in getting established."

Other species. There was general agreement on the "rejected" shrubs in the way of comments. There were single reports of game use of sand cherry, false indigo and bayberry (duck nest and rabbit use) and reports of occasional rabbit use of fragrant sumac and Forsythia. Good survival was noted for some (honeysuckles, sand cherry, and false indigo), but little game use to go with it. Those who have Amur honeysuckle might watch for use of the persistent berries by game birds--song bird use was reported. I feel we should stay with the 10 preferred shrubs--concentrating on five or six--while we continue looking for better shrubs and techniques.

## Suggestions for Research and Management

In addition to welcome comments on the job research should do in this field, there was a recurring theme--direct or implied--that we should increase the size of shrub plantings. We all have plenty of evidence that small plantings have little effect on game use or on the population but have had little opportunity to observe the effects of large plantings. I think that there is no question but that we should go to larger shrub plantings. Occasional field boundaries or scalp plantings of grape, gray dogwood, or nannyberry in special site situations might be the only exception.

Size of plantings. "Thick enough clumps, or wide rows." "Use block plantings." "Block plantings," "go to larger blocks," etc. Jack Cook

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summarizes how most of us feel, "I think the overlying limitation is that small plantings of even the best wildlife plants growing successfully are worthless. Unless the plantings are large enough to be significant (and I mean large--in long strips or large blocks), the ecology of the area will not be changed enough to do any good."

Plants to try. Suggestions were made to try Siberian pea, lilacs ("have flushed grouse, used by rabbits"), bittersweet, blackberries, oaks, and faster growing cedars for southern Michigan.

We have, in addition to current tests, plans to try several of the cotoneasters (heavy fruit crops of persistent berries), and sea buckthorn, a relative of autumn olive that is a favorite in English wildlife plantings. Two chokeberries, European and American mountain ash, and several kinds of crabapples are the main ones we have in field tests now. Our "nut man" (Earl Gordinier) will be getting out a report on his specialty.

Test plantings. Several men suggested that we have test or demonstration plantings in each district to check the different soil and climatic conditions. This is a step between our Rose Lake test planting and general use. We skipped it in the case of autumn olive, but we should try to see that buffalo berry and Washington haw get distribution in each district and an exposure to a wide variety of conditions before we plow under all the other plants.

Methods of establishment and encouragement of natural shrubs. Most of the comments here were on two favorite plants--grape and gray dogwood--that have problems of establishment. Use of fertilizer to encourage spreading and heavier fruit production was suggested for gray dogwood. "Wild cuttings, try concord grapes, rooting hormones" were suggested for grape. "Pruning, encouragement of blackberries, cultivation of natural shrubs," were other suggestions.

I have no argument with such suggestions, and I hope we can do something along this line. However, many of the possibilities involve intensive and time-consuming work that most programs can't afford. Release cuttings for dogwood and special cuttings to encourage grape (both done in winter) may be the only reasonable approach. Perhaps the elm beetle will bring some good by encouraging dogwood.

## Shrub Appraisal in New York

New York reported on 61 species after 20 years of growth on two different sites (Some Experimental Shrub Plantings--20 Years Later, R. E. Smith, N. Y. Fish and Game, July, 1964). I think you will be interested

in their comments on the same species that we have considered.

False indigo. Its value as a wildlife plant seems doubtful.

Silky dogwood. Fruits in September and birds eat it immediately. The natural abundance of this shrub, coupled with its somewhat ephemeral wildlife value, indicates that it would be better for purposes other than wildlife plantings.

Gray dogwood. One planting spread and took over site--heavy wildlife use in October and early November, mostly songbirds. Its widespread distribution would seem to make it unnecessary to plant this species.

Autumn olive. One planting attained a height and spread of 12 feet, the other winter-killed repeatedly and was browsed back by deer. Fruits eagerly sought by birds and squirrels. Reproduction abundant on sandy soils. Autumn olive seems best suited to relatively dry sites--will be winter-killed on wet sites.

Honeysuckles. Thought tartarian was good for travel lanes and amur good because of its late fruiting.

Crabapple. Observed "Sargent" and "Toringo" crabs. Both heavily used by game and both highly recommended. Sargent sprouts from roots and assumes a colonial habit.

Sand cherry. Affected by fire blight and heavily browsed by deer. Not recommended.

Buffalo berry. One planting a failure. Native to New York, occurring on dry, limy soils, usually at the edge of rocky banks. Its fruits are attractive to birds, but, ripening in June and July, they are soon consumed. The plant is dioecious, which is another reason for eliminating it from consideration for wildlife planting in the state. (Don't worry, Harold, this is not "your" buffalo berry, but is Sheperdia canadensis. I was trying to get some for trials until I read this.)

American mountain ash. Heavily browsed by deer. Susceptible to stem borer, so not suitable. Fruit on till late November or early December.

Viburnums. Wild raisin--fruit too preferred, gone before October.
Nannyberry--recommended for woodland edges. Fruits persistent and eaten by wildlife.
Highbush cranberry--considerable wildlife use, mostly birds (waxwings, catbirds in early spring). Both varieties (European and American) do better on moist rather than dry sites.
Black haw and arrowwood--fruits of both are too preferred. Gone by October.

New York considers the following species worth continued trials: Cornelian cherry, selected crataegus, autumn olive and the related "cherry" elaegnus, amur honeysuckle, mistletoe honeysuckle, the crabapples as a group, multiflora rose (hardy variety), European mountain ash, linden viburnum, European highbush cranberry, nannyberry, black haw, and, possibly, Wright viburnum.

They seem to be in general agreement with our observations.

## General Recommendations for Shrub Plantings

I. Location.

A priority of sites as follows:

1. A wide band alongside existing cover (swale, swamp, woods, pine planting, etc.)

2. A wide band extending out from existing cover into open land.

3. A wide strip alongside an old fencerow in open land--especially if trees in the fencerow are lopped.

4. Large blocks or wide strips in open land away from cover. It is doubtful that shrubs alone will provide complete year around cover, but if a part of more intensive management (meadows, food patches, pine plantings, brush piles, etc.) shrubs will provide a major ingredient.

II. Size.

It's difficult to make exact recommendations, but "think bigger" than we have in the past. The blocks should be at least an acre and strips at least eight rows wide. Think about using old food patch sites that are difficult to manage for grain or are hard to reach or work with your new equipment. Isolated low spots with better soil and moisture are good for rose (while somewhat subject to winter-kill, we have had vigorous resprouting). Care and preparation will require less time and effort if we concentrate our shrub plantings in fewer but larger areas and the job will be more satisfactory. Don't confuse "size" of planting with "numbers" of stems. We should increase size, not necessarily numbers. Perhaps we have often thought too big on numbers and have had to plant off-site with no preparation or care.

III. Site.

This is just as important as selecting the best species, and I wish I could describe each site in detail and follow with recommendations. I hope that dividing sites into "good," "fair," and "poor" will be some help--realizing that a good site on Tuscola might be a fair site on Dansville.

1. Poor. Sand or loamy sand, well drained, poor natural cover (not bare sand!). Bellefontaine, Ottawa, Berrien, Coloma, Oshetemo, etc.

   Use - Autumn olive, buffalo berry, and occasionally Siberian crab.

   Preparation - Preparing the site a year ahead always helps even on poor sites, but you can get by without care on some sites with autumn olive. I would only do this if you are caught with your supply exceeding your demand. Put autumn olive on the unprepared sites and use the prepared sites for other shrubs.

2. Fair. Sandy loams, well drained, or, some poorly drained loamy sands. Moderate natural cover of perennial grasses. Hillsdale, Berrien, Brady, Genesee, Griffin, etc.

   Use - Autumn olive, buffalo berry, Siberian crab, highbush cranberry, and Washington haw.

   Preparation - Always prepare the site the spring before planting and summer fallow, control weeds for two years.

3. Good. Loams and sandy loams, good natural cover. Hillsdale, Miama, Fox, etc.

   Use - Multiflora rose, Siberian crab, nannyberry, highbush cranberry, and Washington haw in regular plantings. Grape and gray dogwood in scalps.

   Preparation - Same as for fair sites.

IV. Preparation.

1. Prepare sites a year in advance. Fit strips in late spring and drag as often as required during summer to control weeds.

2. Work up the site before planting.

3. When quack grass is a serious problem you should plan ahead two years. Either summer fallow for two years or spray with dalapon in fall, plow and summer fallow the next summer, and plant the second spring.

V. Care.

Weed control during the first two years is an essential part of shrub establishment. The following advice is the best we can come up with at present. We are checking different herbicides and will report any future improvements to you.

1. Plant rows far enough apart so that you can operate a disk between rows without harming the root systems of the shrubs. This will serve all species except rose which spreads too much during its first year. Regular row cultivation takes too much time and care and usually requires additional hand labor for a good job. A disk width is wider than our normal rows and we don't know its effect on habitat quality. Mature autumn olive and buffalo berry will fill the area between these wider rows but most of the other shrubs will not. I don't think this is particularly bad--especially with a large planting--and it could provide a good nesting site. Conceivably we could seed areas between the rows to an improved herbaceous species at the end of the second year of cultivation.

   Further details on care have to be considered by species.

2. Multiflora Rose - Has to have two years of intensive care after planting, but because of its spreading habit you can't use regular cultivation or a disk for in-between rows. Fortunately, simazine does a good job of weed control. Spread granular simazine with a cyclone seeder at the rate of two pounds per acre (active) over the entire planting area. Put it on immediately following the planting and repeat the second spring. Simazine has changed rose from the most difficult shrub to care for to the easiest to care for. We recommend about an eight foot spacing between rows.

3. Autumn olive and buffalo berry - Autumn olive will not stand simazine during its first year and we suspect this will also hold true for buffalo berry. Plant in wide rows so you can disk between rows. For "in-the-row" care you are on your own--cultivate, hoe or pull the weeds! It is likely that a directed spray of amino triazole, using a hand sprayer when weeds are young, will solve the weed problem. If soil is not disturbed and if summer fallowing was thorough, there should be no major weed problem in the first year. For the second year of care you can use simazine.

4. All other shrubs (and conifers) - We recommend the wide row spacing for disk cultivating between rows and spreading simazine in the shrub row itself. While they could be treated like multiflora rose (simazine over the entire planting area) the cost will be reduced considerably by using the herbicide only around the shrubs.

   If weeds get ahead of you the following mixture sprayed around the plant (not on the foliage) will kill them. Per 10 gal. of water: 100 gms. of amino triazole (or 260 gms. of amitrole-T) with 130 gms. of 80% simazine. We have used small hand sprayers, carrying a water supply with us in a 50 gal. drum. It is more difficult to control the spray with power sprayers although we have used them successfully. Spray to wet the foliage of the grass and weeds--do not saturate.

   Note from Earl J. Gordinier: You may have to experiment to obtain the correct amount of herbicide per 10 gallons of water. With experience you will become an artist--spraying lightly close to the shrub, heavier as you leave the "drip line" of the shrub. Amino triazole-simazine treatments should be made in May. By late June weeds are maturing; are hard to kill. (See note in appendix on measuring rates). Try these herbicides. Get experience. Be your own expert. This is the easiest, quickest, cheapest, and best weed control method. Don't be satisfied with pre-historic methods. Keep records. If results are erratic, records will tell what was wrong.

5. Age of planting stock - I would expect 1-0 for rose and 2-0 for other shrubs would normally be the best. We can rely on Jim Buerge to send out the best he has available. He has problems of his own in that, while 1-0 may be small, the 2-0 often gets such big roots it won't go through the planter satisfactorily. In such case it would be better to try to nurse the 1-0 by giving it good care rather than plant 2-0 with the roots exposed.

Thanks to all participants for the help and suggestions on the use of shrubs. You don't have to wait for a formal request to send me any additional ideas.

# APPENDIX A

## Plants Mentioned in Report

| Scientific Name | Common Name |
|---|---|
| Amorpha fruticosa | False indigo |
| Cornus Amomum | Silky dogwood |
| Cornus racemosa | Gray dogwood |
| Corylus americana | Hazelnut |
| Crataegus Phaenopyrum | Washington thorn (haw) |
| Elaeagnus umbellata | Autumn olive |
| Elaeagnus multiflora | Cherry elaegnus |
| Forsythia suspensa | Forsythia |
| Hippophae rhamnoides | Sea buckthorn |
| Lespedza bicolor | Bicolor lespedeza |
| Lonicera Maackii Var. podocarpa | Amur honeysuckle |
| Lonicera Morrowi | Morrow's honeysuckle |
| Lonicera tatarica | Tartarian honeysuckle |
| Lonicera quinquelocularis | Mistletoe honeysuckle |
| Malus baccata | Siberian crab |
| Malus Sargentii | Sargent's crab |
| Malus Toringo | Toringo crab |
| Malus Zumi | Zumi crab |
| Myrica pennsylavanica | Bayberry |
| Prunus Besseyi | Western sandcherry |
| Prunus mas | Cornelian cherry |
| Rhus aromatica | Fragrant sumac |
| Rosa multiflora | Multiflora rose |
| Sheperdia argentea | Silver buffalo berry |
| Sheperdia canadensis | Buffalo berry |
| Sorbus americana | American mountain ash |
| Sorbus aucuparia | European mountain ash |
| Symphoricarpus orbiculatus | Coralberry |
| Viburnum cassinoides | Wild raisin |
| Viburnum Lentago | Nannyberry |
| Viburnum Opulus | European highbush cranberry |
| Viburnum prunifolium | Black haw |
| Viburnum recognitum | Arrowwood (formerly V. dentatum) |
| Viburnum trilobum | American highbush cranberry |
| Viburnum Wrightii | Wright's viburnum |
| Viburnum dilatatum | Linden viburnum |
| Vitus vulpina | Wild grape |

Scientific names from Grimm (The Book of Shrubs) and Bailey (The Standard Cyclopedia of Horticulture).

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# APPENDIX B

## Measuring Rates of Amino Triazole and Simazine

In 1962 more than 10,000 acres of orchards in Michigan were sprayed with chemicals to control weeds and grass. The area treated in 1965 was probably more than four times that average. The most popular spray is amino triazole (2 pounds active per acre) and simazine (5 pounds per acre).

Accurate rates using a hand sprayer are practically impossible and, fortunately, unnecessary. We have aimed for the 2 and 5 pound rate and have seen no damage although we must have been way off at times.

In using directed sprays one ordinarily covers about 200 square feet with each gallon. On this basis one level tablespoonful of amino triazole and two level tablespoonsful of simazine in a gallon of water will provide a treatment roughly equivalent to 2 pounds, and 5 pounds per acre of the active ingredients of these materials.

The following figures may be useful:

1 level tbsp. of amino triazole weighs 8 grams
1 level tbsp. of simazine weighs 6 grams
2 tbsp. = 1 (fluid) ounce
16 tbsp. = 1 cup

The rate will depend on the operator. If vegetation and soil is saturated the treatment will be excessive and damage could result. Do not spray so much that the liquid begins running off the vegetation. One should spray bare ground when using the combination treatment since the simazine will control weeds that germinate after treating. When treating dry, bare ground a change from light to dark is about right. Of course, you should be careful not to over-spray close to a shrub, and you should direct spray to avoid foliage of plants you do not wish to kill.

Treat when grass and weeds are growing actively--late April and early May, and perhaps in September if growing conditions are good. If after two weeks grasses aren't showing a pronounced effect, you might try a more concentrated mixture, or wet the sprayed area more thoroughly.

This method is not complicated. Try it. You will be surprised at the simplicity of the method, its effectiveness and its efficiency.

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